AGU FALL MEETING
San Francisco | 12–16 December 2016

B31G-0540: What drives the interannual variations in carbon fluxes and balance in a tropical rainforest of French Guiana?

Wednesday, 14 December 2016
08:00 - 12:20
Moscone South - Poster Hall

Amazon rainforest – a major contributor to the global carbon sink, is not on steady state and this affects terrestrial carbon pools. Yet, information on the effect of climatic extremes to long-term carbon fluxes is lacking. Thus, using an 11-year eddy covariance data, we examined the carbon fluxes and net carbon uptake in French Guiana's tropical rainforest to determine the interannual and seasonal variations in gross primary production (GPP), ecosystem respiration (RE) and net ecosystem exchange (NEE), so with climatic drivers influencing such changes from 2004 – 2014. GPP varies from 3394.9 g C m^{-2} yr^{-1} to 4054.5 g C m^{-2} yr^{-1}. RE is more varied than GPP (3057.4 g C m^{-2} yr^{-1} – 3425.9 g C m^{-2} yr^{-1}. NEE has large interannual variability from –68.2 g C m^{-2} yr^{-1} to –596.2 g C m^{-2} yr^{-1}. NEE during wet seasons had higher sink strength than in dry periods. The sudden drop of RE during wet period in 2007 – 2009 may help explain this as it almost doubled the net uptake while GPP had slighter declines. The pattern of NEE appears to be driven by higher rate of increase in RE during dry season with less comparable rise in GPP. This suggests that over 11 years, the ecosystem did not suffer any extreme dry condition strong enough to induce severe decrease in RE. Annually, global radiation (Rg) explains 49% (P<0.0001) for GPP, 42% (P<0.0001) for RE, and 21% (P<0.0001) for NEE. During the wet season, Rg still controls GPP (r^2 = 0.45; P <0.0001), RE (r^2 = 0.30; P<0.0001;) and NEE (r^2 = 0.31; P<0.0001). However, relative extractable water (REW) manifested more strongly during the dry period explaining mainly the variations of GPP (r^2 = 0.20; P < 0.0001), RE (r^2 = 0.33; P < 0.0001) and NEE (r^2 = 0.25; P < 0.0001). Deep rooting system of trees may have caused GPP unsuppressed despite low soil moisture. Therefore, modeling studies must consider incorporating soil water measurements in deeper soils as most tropical trees are dependent on deep soil moisture to avoid water stress.

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